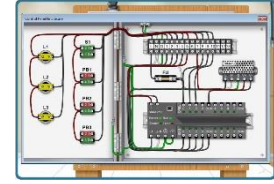# The University of Texas at Tyler

*Soules College of Business*
*School of Technology*
*Department of Technology*

## TECH 2319 – PROGRAMMABLE LOGIC CONTROLLERS

### Course Syllabus

Course: TECH 2319
Title: Programmable Logic Controllers
Section: 001
Pre-requisite: None
Semester: Spring 2021
Class Time: Tues 6:00pm-8:45pm
Class Locations: COB 160

Instructor: Mohammed Ali, PhD, MBA, CSMS
Office: Longview Univ. Ctr. 218
Phone: (903) 663-8218
Email: mohammedali@uttyler.edu
Preferred Method of Contact: email
Office Hours: MW 2:00 pm -5:00 p.m.
and by appointment

## Course Description:

Introduction to programmable logic controller logic circuits, inputs and outputs, power supplies, data sheets, safety programming, types of processors and memory organization, PLC architecture, ladder logic, and task-oriented programming methods.

## Lecture Notes and Classroom Environment:

The lecture notes will be made available online on the Canvas site for the course. Additionally, students are required to take notes during face-to-face classes (if necessary and take place) on supplemental lecture materials, problem solving and diagrams that instructor writes/draws on the classroom board. A student is **NOT allowed** to take photos of notes on the board.

## Textbook (Required)

Max Rabiee (2017). Programmable Logic Controllers: Hardware and Programming (4thed.). Tinley Park, IL: Goodheart-Willcox. ISBN: 978-1631269325.

## Course Objectives:

Upon successful completion of this course, participants will be able to:
1. Describe PLC components, controller, fixed and modular devices.
2. Connect sensors and switches to PLC ports.
3. Perform binary math operations and conversion between binary and decimal numbers.
4. Identify electrical symbols, motor controls and overload relays.
5. Create relay logic circuits for process and industrial control problems.
6. Create PLC ladder logic diagrams, test, print and save them.
7. Understand various timers, counters, fault and interrupt systems.
8. Write a report and present results.

## Student Learning Outcomes:

1. Describe the benefits of PLCs over electromechanical relay logic systems by successfully passing quizzes and exams with a 70% or better.

2. Distinguish between fixed and modular PLC devices, input or output modules for Festo LabVolt PLC Trainer by successfully passing quizzes and exams with a 70% or better.
3. Create PLC ladder logic programs for operation and monitoring relay logic, timer, counter, comparison, move and sequencer instructions by successfully completing lab exercises, passing quizzes and exams with a 70% or better.

## **Core Competencies**

1. Computer-Based Skills – the student will complete written assignments using the word processor.
2. Communication Skills – the student will exhibit a mastery of both written and oral skills in completion and presentation of the assigned projects.
3. Interpersonal Skills – the student will interact in class discussion to clarify thinking regarding technological progress.
4. Problem Solving (Critical Thinking) – the student will use conceptual thinking to analyze and make determinations regarding the use of industrial processing equipment.
5. Ethical Issues in Decision Making and Behavior- the student will gain an appreciation of the ethics of technology through examination of various processing.
6. Personal Accountability for Achievement – the student will complete the projects at the time designated by the instructor and will enter into class discussion.
7. Competence in Technology Principles
   a. Competence in major field and grounding in other major technology major core areas – the student will gain an appreciation of the benefits and problems of technological growth.
   b. Exposure to and appreciation for industrial experiences such as industrial tours, work-study options and cooperative education, senior seminars – Optional plant tours will be offered.

| Program Outcomes | TECH 2319 |
|---|---|
| 1.  An ability to apply the knowledge to practical uses of PLCs | X |
| 2.  An ability to troubleshoot PLC errors and determine viable solutions | X |
| 3.  An ability to design a PLC system, component, or process to meet desired needs. | X |
| 4.  An awareness of safety issues and practices. | X |

## **Grading Policy and Criteria to Determine Final Course Grade:**
Grading components are assigned weights*

| | |
|---|---|
| Attendance | 100 |
| Chapter Quizzes | 200 |
| Lab Exercises | 500 |
| Midterm exam | 100 |
| Final Exam | 100 |
| TOTAL POINTS = | 1000 |

*NOTE: This is NOT set in stone, pending the number of quizzes and lab exercises are given.

## **Grade Scale Breakdown:**

A=90 - 100%
B=80 - 89%
C=70 - 79%
D=60 - 69%
F=BELOW 60%

## Course Policies:

## Attendance:

Attendance is mandatory and will be taken at every scheduled class and laboratory period. No make-ups unless:
1. Organized university trip.
2. Illness or death in immediate family (mother, father, brother and/or sister).
3. Illness of student.

Each one of these will require either a **doctor's statement** or a **signed statement** from the individual in charge of the trip.

A student will lose a letter grade in the course each time s/he is absent or late 3 times. Any student entering the classroom 1 second after the scheduled starting time will be considered late.

## Talking:

While the instructor is talking (in a face-to-face class), it is understood that no one should be talking. Students talking in class prevent other students from hearing the instructor and learning the material that is required to pass the course. If you are caught talking, then you **will earn a zero on your daily quiz grade**. On the second offense, you will be **asked to leave**. This behavior is rude and disruptive and most students who talk in class typically earn lower grades. It should be noted that students who have been granted permission to talk by the instructor should not be interrupted as well. For any reason, if a student does not like to listen the lecture or any personal issue arises, he/she can leave the classroom gently, but NOT allowed to disturb or distract the classmates. Please respect your fellow classmates, who have paid for this course and want to listen the lecture and learn the content.

## Chapter Quizzes and Exams:

Chapter lectures will follow-up with online quizzes. Content for examinations will be taken from lectures, demonstrations, quizzes, reading and writing assignments, laboratory exercises (if any) and any audio-visual materials used, i.e. films, tapes, slides, etc. **Cell phones, laptop, iPad or other electronic communication equipment besides a calculator are not allowed to use during the exam.** First violation will receive warning, and the second violation will result forfeits his/her right to take the exam.

Make up quizzes and examinations are the student's responsibility. **No excuses will be accepted after the due date is passed**. The instructor must be notified **prior** to the scheduled exam. If not, the student forfeits his/her right to take the exam. However, make-up exams will be on a different set of questions. *Quizzes and assignments will not be made up unless a **prior** acceptable excuse for an absence has been received by the instructor.*

## Late Work:

All work not turned in on time will have an automatic reduction in value to 50% of its full value. **Work that is not turned in by the next class will NOT be accepted.** Exceptions to this will be as per University Policy concerning absences from class. It is student's responsibility to take quiz and submit assignment by due date or the date administered them. **Instructor is NOT responsible for reminding a student about missed quiz, assignment or exam.** If you know a quiz/assignment/exam will be late for a valid reason, inform your instructor in advance to avoid unnecessary penalty.

**Format for Lab Exercise Assignment Reports:**

Each assignment is expected to be written in such that the reader can easily examine the contents. Materials that are hard to read or require special handling to get at will not be graded. The cover page must contain the following:

1. Assignment Title and Chapter Number bolded
2. Your Name: Prepared by Joe Student
3. Your University I.D Number
4. Course Name and Number
5. The Date
6. Submitted to Dr. Mohammed Ali

Your grade will reflect the quality of the presentation/paper.

**Cell Phones**:

Cell phones are to be seen and not heard. Make sure you turn off your cell phone during class or turn it to the vibrator mode. A ringing cell phone is a distraction and is inappropriate for the classroom. Allowing your cell phone to ring and then answering it is very rude. It is not fair to your fellow classmates who have paid for this course. **Please be considerate and make sure your cell phone is turned off during any of your classes. Students will be asked to leave for the day if this behavior continues.**

**Additional Course Management and Classroom Policies**:

1. No retakes of quizzes or exams for "technical difficulties or internet interruptions". Get reliable technology or use the campus resources with Ethernet cabling, NOT Wi-Fi.

2. No excuses to leave the country and miss final exams or final presentations in class. A zero for these and any other assignments will be given.

3. No telephone usage of any kind in the classroom - texting, talking, social media...... . You will be asked to leave the classroom and counted as absent for the day and NOT allowed to make up any assignments, quizzes, etc.

4. Talking during class while the professor is talking, a guest speaker, or student presentations will be penalized - No class participation points - up to 25% of the overall score.

5. If a student is more than 5 minutes late without an excuse, it counts as an absence. Three absences is an automatic reduction of a letter grade in the class.

**Tentative Schedule**

**WEEK 1: Jan 11 – Jan 16, 2021**
Course syllabus descriptions, class polices and discussion
Chapter 1: Programmable Logic Controller (PLC) Overview

**WEEK 2: Jan 17 – Jan 23, 2021**
Chapters 2: PLC Selection, Components, and Communication.

**WEEK 3: Jan 24 – Jan 30, 2021**
Chapter 3: Number Systems and Code

**WEEK 4: Jan 31 – Feb 6, 2021**
Chapter 4: Input/output Devices and Motor Controls

**WEEK 5: Feb 7 – Feb 14, 2021**
Chapter 6: PLC Programming

**WEEK 6: Feb 15– Feb 20, 2021**
  Lab Exercise 1: Familiarization with the PLC Trainer and RSLogix Micro
  Print Ex-1-FESTO PLC Basic Prog Student Manual from Canvas before coming to the lab

**WEEK 7: Feb 21 – Feb 28, 2021**
  Mid Term Review (posted online)
  Lab Exercise 2: Online Operations and Monitoring I/O Data Files
  Print EX-2-PLC FESTO Basic Prog Student Manual from Canvas before coming to the lab

**WEEK 8: Mar 1 – Mar 7, 2021**
  Mid Term Exam

**WEEK 9: Mar 8 – Mar 14, 2021**
  Spring Break, No classes

**WEEK 10: Mar 15 – Mar 21, 2021**
  Lab Exercise 3 & 4: Relay Instructions Part I and II
  Print EX-3&4 - PLC FESTO Basic Prog Stu Manual from Canvas before coming to the lab

**WEEK 11: Mar 22 – Mar 28, 2021**
  Chapters 8: PLC Timer Instructions
  Lab Exercise 5: Timer Instructions
  Print EX-5&6 - PLC FESTO Basic Prog Stu Manual from Canvas before coming to the lab

**WEEK 12: Mar 29 – April 4, 2021**
  Chapters 9: PLC Counter Instructions
  Lab Exercise 6: Counter Instructions
  Print EX-5&6 - PLC FESTO Basic Prog Stu Manual from Canvas before coming to the lab

**WEEK 13: April 5 – April 11, 2021**
  Chapter 11: PLC Compare, Jump and MCR Instructions
  Lab Exercise 7: Comparison Instructions
  Print EX-7 - PLC FESTO Basic Prog Stu Manual from Canvas before coming to the lab

**WEEK 14: April 12 – April 18, 2021**
  Chapter 15: Sequencer Instructions
  Lab Exercise 9: Sequencer Instructions
  Print EX-9 - PLC FESTO Basic Prog Stu Manual from Canvas before coming to the lab

**WEEK 15: April 19 – April 25, 2021**
  Review for Final Exam
  Extra Credit Lab Exercises on Traffic Light, Electro-pneumatic, EMS DC motor,
  Steeper Motor or Bottling Process

**WEEK 16: April 26 – April 30, 2021**
  Final Exam

**Date of Final Exam:** Tuesday 04/27/2021 at 6:00 pm (face-to-face or Online, will be decided according to the guidelines provided by the University Administration).

**Last Date to Withdraw from course(s):** Monday, March 29, 2021.

**Census Date and Policies:** Refer to the respective section below.

**When do classes start and end?**

Classes begin Monday, January 11 and end Friday, April 30. Classes from January 11 through February 13 will be delivered online.

## Important Covid-19 Information for Classrooms and Laboratories

Students are required to wear face masks covering their nose and mouth, and follow social distancing guidelines, at all times in public settings (including classrooms and laboratories), as specified by Procedures for Fall 2021 Return to Normal Operations. The UT Tyler community of Patriots views adoption of these practices consistent with its Honor Code and a sign of good citizenship and respectful care of fellow classmates, faculty, and staff.

Students who are feeling ill or experiencing symptoms such as sneezing, coughing, or a higher than normal temperature will be excused from class and should stay at home and may join the class remotely. Students who have difficulty adhering to the Covid-19 safety policies for health reasons are also encouraged to join the class remotely. Students needing additional accommodations may contact the Office of Student Accessibility and Resources at University Center 3150, or call (903) 566-7079 or email saroffice@uttyler.edu.

## What should I do if I may have been exposed to or test positive for COVID-19?

Students, faculty and staff who have been exposed to COVID-19 or who test positive for Covid-19 should immediately self-report this information.

If you have recently been on campus, report via the COVID-19 hotline, 903.565.5999, so that steps can be taken to prevent any possible spread.

If you have NOT recently been on campus, report by completing this form.

## Recording of Class Sessions

Class sessions may be recorded by the instructor for use by students enrolled in this course. Recordings that contain personally identifiable information or other information subject to FERPA shall not be shared with individuals not enrolled in this course unless appropriate consent is obtained from all relevant students. Class recordings are reserved only for the use of students enrolled in the course and only for educational purposes. Course recordings should not be shared outside of the course in any form without express permission.

## Technology Access:

This course is designed to be delivered via face-to-face meeting, additionally dissemination of supplemental study/lecture resource materials via online using Canvas, and will require reliable technology. Required technology includes:

### Hardware:

- Desktop or laptop computer with internet access.
  - Note: if your internet connection is down, it is your responsibility to see access to avenue such as UTT computer lab (located BEP249 or HPR 134), a public library to complete and submit your work on time.

- A camera, microphone and sound speakers.

### Software:

- A current operating system (Microsoft or Apple)
- A web browser (Internet Explorer, Chrome, safari, Firefox, etc.)
- Access to Canvas and Patriot mail. Note: Google Chrome does not support JAVA. Do not use it for Soft Chalk lessons.

- Microsoft Office (Available at no charge to student at https://www.uttyler.edu/it/office365/proplus.php
- Note: Do NOT use Google Docs for writing assignments
- Also standard plug-ins such as: Java, Flash, QuickTime, Adobe Reader or another FDF reader such as Preview on the Mac.
- Other software as noted in each module such as EPortfolio

**Technical Support:**

Technology related problems (e.g., Patriot email, Canvas, access problem to the *my*UTTyler etc.) can often solved by calling the UT Tyler Information Technology Hotline (903) 565-5555 *x*2 or by emailing them at itsupport@patriots.uttyler.edu. In your email be sure to include:

- The title an number of the course
- The Canvas page in the question
- A description and message number for any error message that you receive
- What were you doing at the time you got error message

**Discrimination:**

The policy of this department is to make your college experience as pleasant as possible. However, if at any time you feel that you are being discriminated against, belittled, or not treated appropriately, please notify the instructor either anonymously or in-person immediately after class. It is not the intention of any of the faculty in this department to make your college experience an unpleasant one. Remember, the first step in the process is to inform the instructor so s/he can be made aware of the problem and take corrective action. If the problem continues to persist, please inform the chair of the department. The dean can then be notified if the problem continues to exist after a few days. A grievance can then be filed in the Office of Student Services if there has still been no change in the instructor's behavior. It should be noted that filing a grievance is a serious act and should NOT be done so just because you received a bad grade on an exam or in the course. Communication is an effective tool to solve problems and is rarely used enough. Most people are not deliberately trying to upset you, they are just not aware of your vantage point.

**Offensive Language:**

Any type of offensive language will not be tolerated in the classroom or laboratory or online. How you speak to your friends outside the classroom is your business, however, when you are in the classroom you must follow the University of Texas rules of conduct. **You will be asked to leave if your language or conduct is offensive.**

**Required Activities Scheduled Outside of Regularly-Scheduled Class time (fees, tickets, procedures and/or forms required):**
Read textbook, review notes, and complete assignments.

**Department Website:** http://www.uttyler.edu/cbt/hrd/tech/

**Commencement:** Friday - Saturday, May 1, 2021

**Holidays:** March 8 -13, 2021 Spring Break holidays.

**UT Tyler Honor Code**

Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

### Students Rights and Responsibilities

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: http://www.uttyler.edu/wellness/rightsresponsibilities.php

### Campus Carry

We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at http://www.uttyler.edu/about/campus-carry/index.php

### Tobacco-Free University

All forms of tobacco will not be permitted in the UT Tyler campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community including students, faculty, staff, university affiliates, contractors and visitors. Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products. There are several cessation programs available to students looking to quit smoking, including counseling quitlines, and group support. For more information on cessation programs please visit http://www.uttyler.edu/tobacco-free.

### Grade Replacement/Forgiveness and Census Date Policies

Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. (For Spring, the Census Date is Jan 25) Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.uttyler.edu/registrar. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date (January 25th) is the deadline for many forms and enrollment actions of which students need to be aware. These include:
- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a "W" grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

### State-Mandated Course Drop Policy

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of

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this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).

Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

**Disability/Accessibility Services**

In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Tyler at Texas offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including non-visible a diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit https://hood.accessiblelearning.com/UTTyler and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with an Accessibility Case Manager. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.

**Student Absence due to Religious Observance**

Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second-class meeting of the semester.

**Student Absence for University-Sponsored Events and Activities**

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

**Social Security and FERPA Statement:**

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

**Emergency Exits and Evacuation:**

Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

**Student Standards of Academic Conduct:** Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

(i)     "Cheating" includes, but is not limited to:
- copying from another student's test paper;
- using, during a test, materials not authorized by the person giving the test;
- failure to comply with instructions given by the person administering the test;

- possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed "crib notes". The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
- using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
- collaborating with or seeking aid from another student during a test or other assignment without authority;
- discussing the contents of an examination with another student who will take the examination;
- divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
- substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
- paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
- falsifying research data, laboratory reports, and/or other academic work offered for credit;
- taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
- misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.

(ii) "Plagiarism" includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another's work and the submission of it as one's own academic work offered for credit.

(iii) "Collusion" includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

(iv) All written work that is submitted will be subject to review by SafeAssign™, available on Blackboard.

**UT Tyler Resources for Students:**

- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu, http://www.uttyler.edu/writingcenter/
- UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu, https://www.uttyler.edu/tutoring/
- The Mathematics Learning Center, RBN 4021, This is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.566.7254) https://www.uttyler.edu/counseling/

**Note: The instructor reserves the right to modify this syllabus. However, Canvas course's Syllabus link will have the most updated syllabus at any point of the semester.**